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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/773,587	02/06/2004	Masahiro Takahashi	0553-0397	6735

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SUITE 2850  
CHICAGO, IL 60606

EXAMINER
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ROY, SIKHA

ART UNIT	PAPER NUMBER
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2879

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/21/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

**Office Action Summary**

Application No.

10/773,587

Applicant(s)

TAKAHASHI, MASAHIRO

Examiner

Sikha Roy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 30 January 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-39 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a). Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

The Response filed January 30, 2007 has been entered and acknowledged by the Examiner.

Further English translation of Japanese priority document filed 1/30/07 has been considered and entered. Translation of the priority document overcomes the rejection of claims set forth in previous office action.

Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent Application Publication 2001/0041268 to Arai et al.

Regarding claim 1 Arai discloses (Fig. 1 para [0013]-[0016], [0030]) a light emitting device comprising a substrate having an insulating surface (alkali glass), a transparent film 2 (silicon oxide represented by SiO<sub>x</sub>) formed over the substrate, a first electrode 3 (transparent ITO) formed over the transparent film, a layer including an organic compound 4 formed over the first electrode and a second electrode 7 formed over the layer including the organic compound. Arai further discloses the transparent

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film SiO<sub>x</sub> has refractive index varying 1.40 to 1.55 from an interface at a side of the substrate to an interface at a side of the first electrode by gradation of x in the thickness direction.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 4, 5, 6, 8 -11,14-16, 19 - 21, 23-25, 27 -30, 33-35 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,894,431 to Yamazaki et al., and further in view of U.S. Patent 5,003,221 to Shimizu.

Regarding claim 1 Yamazaki discloses (Fig. 5B, 6 column 8 lines 10-55) a light emitting device comprising substrate 501 having insulating surface, a first electrode 502 formed over the substrate, a layer including an organic compound 505 formed over the first electrode and a second electrode 506 formed over the organic compound.

Yamazaki is silent about a transparent film formed over the substrate wherein a refractive index of the transparent film gradually varies from an interface at the side of the substrate to an interface at a side of the first electrode.

Shimizu in relevant art of EL displays discloses (Fig. 2 column 3 lines 11-28, column 4 lines 30-48, column 7 lines 5-29) an EL element comprising a substrate 11, a transparent film 12 formed over the substrate and a transparent first electrode 13

formed over the transparent film wherein the refractive index of the transparent film 12 gradually varies from an interface at a side of the substrate to the interface at a side of the first electrode (refractive index of the thin film layer is changed to be approximated to the refractive index of the substrate and that of the first electrode). Shimizu teaches that this configuration minimizes reflection at interfaces between the layers and can efficiently emit light with high luminance.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to include the transparent film formed over the substrate wherein the refractive index of the transparent film gradually varies from the interface at a side of the substrate to the interface at the side of the first electrode of Yamazaki as taught by Shimizu for minimizing reflection at interfaces between the layers and efficiently light emission with high luminance.

Regarding claim 2 Shimizu discloses (column 4 lines 40-48) the refractive index of the transparent film gradually increases from the interface at the side of the substrate (glass with refractive index 1.5) to the interface at the side of the first electrode (made of ITO with refractive index 1.9).

Regarding claim 4 Yamazaki discloses (Figs. 8, 9 column 11 lines 42-65) the light emitting device is incorporated in video camera, playback DVD, mobile computers.

Regarding claim 9 Yamazaki and Shimizu disclose all the limitations which are same as of claim 1 and additionally discloses (Shimizu Fig.2 column 7 lines 5-29) the transparent film comprises plurality of substances which includes a first substance oxygen and a second substance silica and the composition ratio of the second

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substance to the first substance gradually varies from an interface at a side of the substrate to the interface at the side of the first electrode.

Regarding claim 10 Yamazaki and Shimizu (Shimizu column 5 lines 59-66) disclose the composition ratio of silica (second substance) to the first substance oxygen gradually increases (oxygen decreasing from  $x=1.8$ ) near the interface at the side of the transparent substrate to (oxygen  $x=1.0$ ) at the side of the first electrode).

Claims 11 and 14 essentially recite the same limitations as of claim 2 and 4 respectively and hence are rejected for the same reasons.

Claims 20,21 and 23 recite the limitations for the method of making the light emitting device which are essentially same as those of claims 1,2 and 4 and hence are rejected for the same reasons.

Claims 28-30 and 33 recite the limitations for the method of making the light emitting device which are essentially same as those of claims 9-11 and 14 respectively and hence are rejected for the same reasons.

Regarding claim 5 Yamazaki discloses (Fig. 7 column 10 lines 20-42) a substrate 400 having insulating surface, a first electrode (cathode)701 formed over the substrate, a layer of an organic compound formed over the first electrode, a second electrode (transparent anode)702 formed over the organic compound layer. Yamazaki discloses the configuration is reversed in a way such that light is emitted in a direction towards the upper electrode (direction indicated by an arrow).

Shimizu discloses (Figs. 1,2) the transparent film of SiO<sub>x</sub> is formed between the transparent substrate and a layer formed adjacent to the transparent substrate, the first electrode and the refractive index is gradually varied so that the refractive index of the transparent film is approximated to those of the first electrode and the substrate at the interfaces in the direction of the light emission so that reflection at interfaces is minimized and EL element can efficiently emit light with high luminance.

Hence it would have been obvious to one of ordinary skill in the art at the time of invention to modify the transparent second electrode of Yamazaki having a transparent film with gradually varying refractive index formed over the second electrode as taught by Shimizu so that the refractive index of the film is approximated to those of the second electrode and that of air at the interface with air outside in the direction of light emission for minimizing reflection at interfaces between the layers and efficiently light emission with high luminance.

Regarding claim 6 it would have been obvious to specify the refractive index of the transparent film of Yamazaki and Shimizu gradually decreasing from the interface at the side of the second electrode (made of ITO with refractive index 1.9) towards the outside (air having refractive index 1.0) in the direction of light emission in a film thickness direction.

Regarding claim 8 Yamazaki discloses (Figs. 8, 9 column 11 lines 42-65) the light emitting device is incorporated in video camera, playback DVD, mobile computers.

Regarding claim 15 Yamazaki and Shimizu disclose all the limitations same as of claim 5 and additionally disclose (Shimizu Fig.2 column 7 lines 5-29) the transparent

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film comprises plurality of substances which includes a first substance silica and a second substance oxygen and the composition ratio of the second substance to the first substance gradually varies from an interface the interface at the side of the second electrode in film thickness direction.

Regarding claim 16 it would be obvious to specify the composition ratio of the second substance (oxygen ) to the first substance (silica) gradually increases from the interface a the side of the second electrode towards outside in the film thickness direction.

Regarding claim 19 Yamazaki discloses (Figs. 8, 9 column 11 lines 42-65) the light emitting device is incorporated in video camera, playback DVD, mobile computers.

Claims 24,25 and 27 recite the limitations for the method of making the light emitting device which are essentially same as those of claims 5,6 and 8 and hence are rejected for the same reasons.

Claims 34,35 and 39 recite the limitations for the method of making the light emitting device which are essentially same as those of claims 15,16 and 19 respectively and hence are rejected for the same reasons.

Regarding claim 36 Yamazaki and Shimizu disclose the transparent film formed on the second electrode such that refractive index of the transparent film gradually decreases from an interface of the second electrode (from 1.9 to 1.0) in the film thickness direction.



Claims 3, 7, 12,13, 17,18, 22, 26, 31, 32,37 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,894,431 to Yamazaki et al., U.S. Patent 5,003,221 to Shimizu and further in view of U.S. Patent Application Publication 20010016262 to Toyoshima et al.

Regarding claims 3, 7,12,17,22, 26,31 and 37 Yamazaki and Shimizu do not exemplify the transparent film comprising silicon oxynitride.

Toyoshima in pertinent art discloses (para [0009],[0013]) a film formed with silicon as target and oxygen and nitrogen used as reactive sputtering gas components so that silicon oxynitride film is formed having refractive index distributed broadly from 1.48 (refractive index of  $\text{SiO}_2$ ) to 2.1 (refractive index of  $\text{Si}_3\text{N}_4$ ). Toyoshima further teaches that this coating with changing amount of nitrogen and oxygen is transparent and shows no substantial absorption of visible light.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use transparent silicon oxynitride as the transparent film of Yamazaki and Shimizu as taught by Toyoshima since it has been held to be within the general skill of the worker in the art to select a known material based on its suitability for the intended use (MPEP 2144.07).

Regarding claims 13,18,32 and 38 Toyoshima discloses the first substance comprises nitrogen and the second substance comprises oxygen.

### ***Response to Arguments***

Applicant's arguments with respect to claims 1-39 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent 6,623,862 to Choi discloses functional film including constituents of silicon, oxygen and nitrogen with gradual content gradients according to a film thickness.

Applicant's amendment (submitted June 23, 2006) necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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**Contact Information**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (571) 272-2463. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (571) 272-2457. The fax phone number for the organization is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

*Sikha Roy*

Sikha Roy  
Patent Examiner  
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